

REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Claims 1-10 are currently being amended and claims 2 and 3 are cancelled without prejudice or disclaimer. New claims 11 and 12 are being added. No new matter is added to the application by the above amendments. After amending the claims as set forth above, claims 1 and 4-12 are now pending in this application.

Claim Rejection under 35 U.S.C. § 112

Claim 10 is rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, Claim 10 is rejected because it recites the thin film composition with the formula $RE_{1+x}Ba_{2-x}Cu_3O_{7-y}$, wherein the Examiner stated that x and y are undefined. This rejection is respectfully traversed, for reasons as discussed below.

Given the chemical formula $RE_{1+x}Ba_{2-x}Cu_3O_{7-y}$, it is clear to a person skilled in the art that x represents a number, and y represents a number. It is clear to a person skilled in the art that the $(1 + x)$, $(2 - x)$ and $(7 - y)$ values in the formula $RE_{1+x}Ba_{2-x}Cu_3O_{7-y}$ are variable values that represent numbers, because in chemistry, the subscript number represents the number of atoms of the element in the molecule.

Accordingly, it is respectfully submitted that one of ordinary skill in the art would understand that x and y are numbers, as ordinarily used in chemical formula. The rejection of claim 10 as being indefinite because x and y are undefined is, therefore, respectfully traversed because x and y would be defined to one of ordinary skill in the art as a number.

Furthermore, new claim 11 is added as dependent on claim 10, and recites that each of x and y represents a numerical value. Similarly, new claim 12 is added and specifies that x represents a number from 0 to 1 and y represents a number from 0 to 6.

It is also clear to a person skilled in the art that for the formula $RE_{1+x}Ba_{2-x}Cu_3O_{7-y}$, the value of x is less than 2 and the value of y is less than 7. This is because, if x is greater than or equal to 2 or y is greater than or equal to 7, the variables for the number of Ba atoms and the number of O atoms becomes zero or negative and the formula becomes meaningless.

Further, it is clear from the specification that for the formula $RE_{1+x}Ba_{2-x}Cu_3O_{7-y}$, x and y represent numbers. The embodiment of the invention described in the application uses Sm123 for the thin film, and the thin film is described by the formula $RE_{1+x}Ba_{2-x}Cu_3O_{7-y}$. Page 2 (lines 17-18) of the original U.S. application defines RE as being a rare earth element such as Sm. Page 10 (lines 16 and 25) and page 11 (line 16) of the original U.S. application specify that Sm123 represents $SmBa_2Cu_3O_6$, which is represented by the formula $RE_{1+x}Ba_{2-x}Cu_3O_{7-y}$ if x is 0 and y is 1.

Because the variables x and y were used in the subscript instead of using the formula $REBa_2Cu_3O_6$, it is clear from the specification to a person skilled in the art that the numbers of atoms of the RE, Ba, and O elements are variable, within the limitations of the formula $RE_{1+x}Ba_{2-x}Cu_3O_{7-y}$, specifically, that x represents a number from 0 to 1, and y represents a number from 0 to 6.

Claim Rejection under 35 U.S.C. §§ 102, 103

Claims 1-10 are rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Hasegawa et al (J. Japan Inst. Metals, 66(4), Pg 320-328, 2002). In view of the claims as amended herein, this rejection is respectfully traversed.

Claim 1 is amended herein to include subject matter from dependent claims 2 and 3. Dependent claims 2 and 3 are cancelled without prejudice or disclaimer, to avoid redundancy. As amended, claim 1 is patentably distinguished over the Hasegawa et al. reference. In particular, as amended, claim 1 is directed to a method of forming a film on a base substrate via an intermediate layer, where the method includes, among other features, “selecting a substance for said intermediate layer so as to satisfy conditions in which each of said interface energies Ea and Eb is lower than $2 J/m^2$, $Ea < Ec$ and $Eb < Ec$.” In addition, claim 1 further

recites that “after calculating an energy Ed of a crystal including the interface and an energy Ep of a perfect crystal taking account of chemical potentials of constituent elements by the first-principles calculation band method, each of said interface energies Ea, Eb and Ec is calculated as Ed-Ep.” Such a method of forming a film on a base substance is neither described nor suggested by the Hasegawa et al. reference. Anticipation of a claim under 35 U.S.C. 102(b) can be found only if the prior art reference discloses every element of the claim. Lindemann Maschinenfabrik v. American Hoist and Derrick, 730 F.2d 1452, 1457, 221 USPQ 481, 485 (Fed. Cir. 1984). Because at least the above-identified features of claim 1 are not disclosed in Hasegawa et al., the Examiner has not established a *prima facie* case of anticipation.

In the rejection, the Examiner did not identify any portion of the Hasegawa et al. reference that meets the above-noted method features of claim 1. Instead, with respect to the interface energies and their interrelations as recited in original claims 1-3, the Examiner stated that the Hasegawa et al. structure and method of making the structure are either the same or substantially the same as claimed by applicants and, thus will possess the same characteristics. The Examiner further argued that “the claimed process steps are anticipated because when the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process.” (citing *In re King*, 801 F.2d 1324, 231 USPQ 136 (Fed. Cir. 1986).)

The Examiner’s argument does not apply to claims directed to a method of making a structure (such as the method of forming a film on a base substance as recited in the present claims). The Examiner cites a legal principle that relates to method claims that define methods of use or what happens when an article of manufacture is placed in the environment of use (i.e., what inherently happens when the article is used), not to claims directed to methods of making an article.

In the case of *In re King*, the Federal Circuit Court considered the issue of “whether an article of manufacture in the prior art can be used to support an anticipation rejection of *method claims that, in essence, simply define what happens when that article of manufacture is placed in the environment in which the article will be used.*” (emphasis added) The Court

found that the Board had made a *prima facie* case of anticipation, because the prior art device “inherently performs the functions disclosed in the method claims on appeal when that device is used in ‘normal and usual operation’.”

Thus, according to the *In re King* case, a *prima facie* case of anticipation may be established because the applicant’s disclosed device would inherently perform functions recited in the method claims during use of the device. However, the present claims are not directed to methods of use (or what happens when the article is placed in an environment of use). Instead, the present claims are directed to a method of forming a film. Accordingly, the Examiner has failed to establish a *prima facie* case of anticipation by referring to principles of inherency (of what inherently happens during use of devices of similar configurations) set forth in *In re King*.

The principles in *In re King* do not apply to methods of making a device. Indeed there is no disclosure or suggestion (or inherency) in Hasegawa et al. of “selecting a substance for said intermediate layer so as to satisfy conditions in which each of said interface energies Ea and Eb is lower than 2 J/m^2 , $Ea < Ec$ and $Eb < Ec$ ” or of calculating interface energies “after calculating an energy Ed of a crystal including the interface and an energy Ep of a perfect crystal taking account of chemical potentials of constituent elements by the first-principles calculation band method,” where “each of said interface energies Ea, Eb and Ec is calculated as $Ed - Ep$.”

While the Examiner argues that Hasegawa et al. teach the lattice match between MgO and BZO and the importance of interface bonding between the layers and interface energies, the Examiner has cited no portion of the Hasegawa et al. reference that teaches or suggests selecting a substance for an intermediate layer that satisfies the specific interface energies relationships recited in the claims. Indeed, there is no disclosure or suggestion in Hasegawa et al. of the method recited in present claim 1, including selecting a substance for the intermediate layer having interface energies as recited in the claim.

As discussed above, the Examiner has misapplied the principles set forth in *In re King*. In particular, the cited case of *In re King* related to claims directed to a method of what

happens during use of a device. The court in *In re King* found that the prior art (having the same physical structure as described by applicant) could inherently be used according to the method of use recited in applicant's claims.

In contrast, the claims of the present application do not define a method of *using* a film formed on a base substance via an intermediate layer but, instead, recite a method of forming [*making*] a film on a base substance via an intermediate layer. It should also be noted that a method invention for *making* a product can be patentably distinguishable from another invention (that is the product), even though both inventions are for the same product. MPEP 806.05(f). This is not contradicted by *In re King*, as the issue of that opinion applies to methods of use (or methods of what happens during use), not methods of making: “The issue . . . is whether an article of manufacture in the prior art can be used to support an anticipation rejection of method claims that, in essence, simply define what happens when that article of manufacture is placed in the environment in which the article will be *used*.” *In re King* at 1326 (emphasis added).

Accordingly, the Hasegawa et al. reference does not describe or suggest (expressly or inherently) the presently claimed invention, including “selecting a substance for said intermediate layer” that satisfies the interface energies relationships recited in claim 1. Furthermore, the principles of *In re King* (relating to inherent use capabilities) do not apply to features relating to methods of making a device. There is no inherency in Hasegawa et al. of selecting a material for an intermediate layer that satisfies the specific interface energy relationships recited in claim 1.

The Examiner also argued that the claimed method steps would have been obvious to a person of ordinary skill in the art over Hasegawa because the reference teaches each of the claimed ingredients within the structure and a method of making it, and it has the same common utility as superconductor tapes. As discussed above, Hasegawa et al. does not disclose or suggest a method of forming a film on a base substrate, including selecting a substance for an intermediate layer to satisfy conditions in which each of said interface energies Ea and Eb is lower than 2 J/m^2 ; $Ea < Ec$, $Eb < Ec$, and wherein after calculating an energy Ed of a crystal including the interface and an energy Ep of a perfect crystal taking

account of chemical potentials of constituent elements by the first-principles calculation band method, each of said interface energies Ea, Eb and Ec is calculated as Ed – Ep.

The Hasegawa reference qualitatively discusses the interface energies, but is silent regarding the procedures for obtaining the interface energies and the quantified energy values. In fact, the Hasegawa reference was not able to obtain the interface energies and thus only mentioned a possibility of relative relations between interface energies.

Furthermore, the Hasegawa reference selected the intermediate layer of BaZrO₃ with a view to suppressing interaction at the interface. Regarding Sm123/BaZrO₃/MgO, the Hasegawa reference only showed data of crystallographic orientations.

There is no prior art of record that teaches or suggests utilizing the first-principles calculation band method in order to quantitatively calculate interface energies in a stacked-layer structure including a base substance, an intermediate layer, and a superconductive oxide film.

The claimed method steps, as amended, would not have been obvious to a person of ordinary skill in the art over Hasegawa et al. Hasegawa et al. do not teach of interface energies Ea and Eb that are lower than 2 J/m², in accordance with amended claim 1. The selection of 2 J/m² for those interface energies is not inherently obvious to one skilled in the art. Further, Hasegawa does not teach of calculating an energy Ed of a crystal including the interface and an energy Ep of a perfect crystal taking account of chemical potentials of constituent elements by the first-principles calculation band method, each of said interface energies Ea, Eb and Ec is calculated as Ed – Ep, as recited in amended claim 1.

In contrast, the present application distinguishes Hasegawa, as explained on page 5, lines 12-19:

“[W]ith the conventional art, it is not possible to quantify the interface energy at the interface between different kinds of substances. Possible increase/decrease of the interface energy has merely been pointed out for only the interface of Sm123/BZO/MgO substance system, as shown in [the Hasegawa reference,] J. Japan Inst. Metals, Vol. 66, 2002, pp. 320-328. To the best knowledge of the inventors, there has been no report in which an interface energy was quantified for an interface

between different kinds of substances including a substance of a complicated structure such as high-temperature superconductor.”

That is, the Hasegawa reference gave a qualitative, rather than a quantitative, discussion of the interface energies because a method of quantifying the interfaces energies was not disclosed or obvious therefrom.

Accordingly, amended claim 1 is believed to be allowable over Hasegawa et al. Because claims 4-12 are dependent on claim 1, they are also patentably distinguishable from the Hasegawa et al. reference at least for reasons noted above with respect to claim 1.

New Claim 12

Dependent claim 12 further distinguishes the claimed subject matter from the cited references. Claim 12 recites, among other features, the film forming method according to claim 10, wherein x represents a number from 0 to 1, and y represents a whole number from 0 to 6.

Conclusion

This amendment adds, changes, and deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

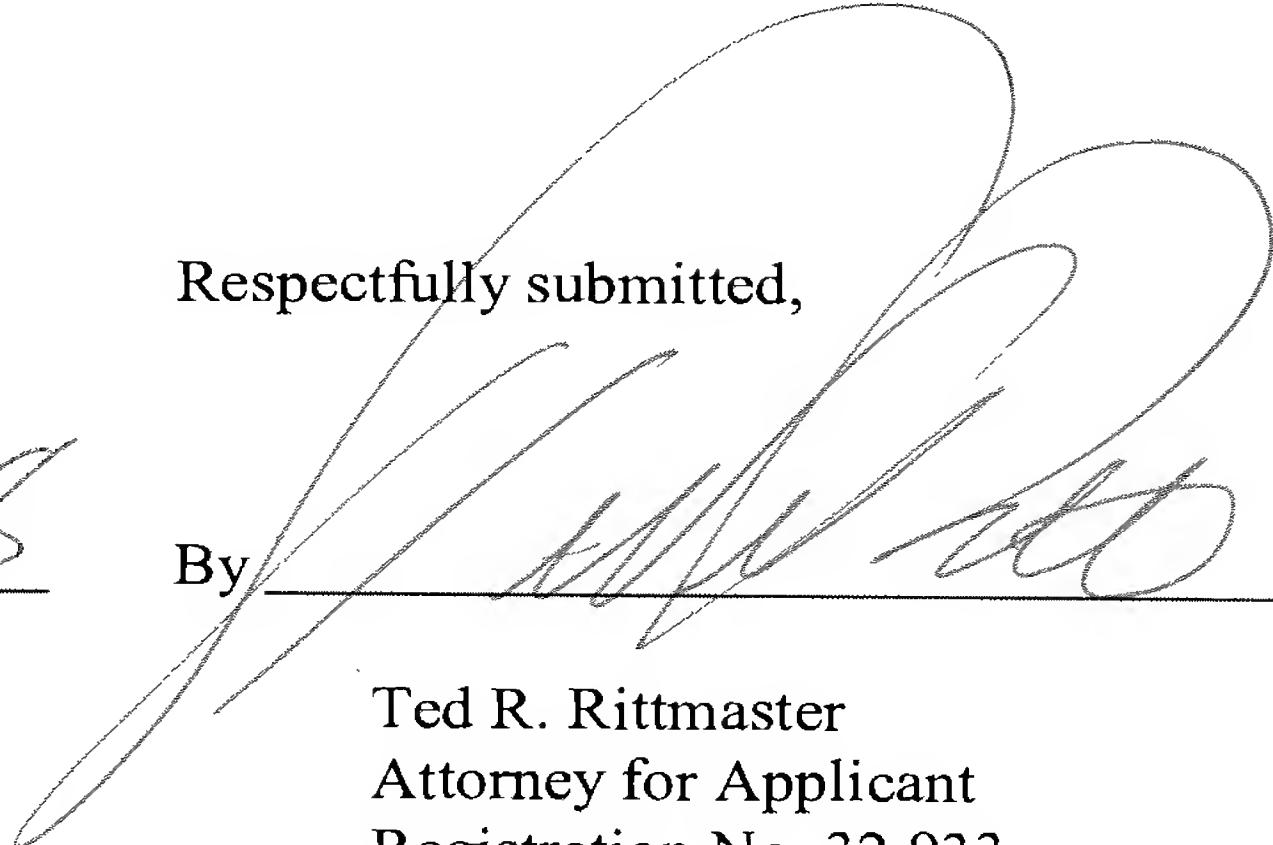
The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected

or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

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FOLEY & LARDNER LLP
Customer Number: 22428
Telephone: (213) 972-4594
Facsimile: (213) 486-0065

Respectfully submitted,

By 

Ted R. Rittmaster
Attorney for Applicant
Registration No. 32,933